WHAT IS CLAIMED IS:

1. A method for mixing fluid streams within a combined fluid stream having a concentration profile, the method comprising:

a) splitting the combined fluid stream into separate fluid streams;

b) rotating the separate fluid streams relative to each other so that the concentration profile is also relatively rotated;

c) recombining the separate fluid streams wherein the recombined fluid stream has a folded over concentration profile and an increased concentration gradient; and

repeating steps a, b and c until the fluid streams are mixed to a desired extent.

2. The method as claimed in claim 1, wherein step b rotates the fluid streams in opposite directions.

3. The method as claimed in claim 1, wherein the concentration gradient is increased exponentially.

4. The method as claimed in claim 1, wherein the fluid streams are mixed by diffusion.

5. The method as claimed in claim 1, wherein the fluid streams are rotated in a helical fashion.

6. The method as claimed in claim 1, wherein the two fluid streams are mixed at Reynolds numbers between 0.1 and 2.

7. A microfluidic mixer for mixing fluid streams within a combined fluid stream having a concentration profile, the mixer comprising:

a plurality of separate microfluidic channels for splitting the combined fluid stream into separate fluid streams, rotating the separate fluid streams and recombining the separate fluid streams to obtain a recombined fluid stream,

wherein the microfluidic channels rotate the fluid streams relative to each other so that the concentration profile is also relatively rotated wherein the concentration profile of the recombined fluid stream is folded over so that the concentration gradient is increased.

8. The mixer as claimed in claim 7, wherein the channels rotate the fluid streams in opposite directions.

9. The mixer as claimed in claim 7, wherein the concentration gradient is increased exponentially.

10. The mixer as claimed in claim 7, wherein the fluid streams are mixed by diffusion.

11. The mixer as claimed in claim 7, wherein the fluid streams are rotated in a helical fashion.

12. The mixer as claimed in claim 7, wherein the two fluid streams are mixed at Reynolds numbers between 0.1 and 2.

13. The mixer as claimed in claim 7, wherein at least one of the separate microfluidic channels has a substantially square cross-section.

14. A microfluidic chip comprising:

a substrate; and

a microfluidic mixer supported on the substrate for mixing fluid streams within a combined fluid stream having a concentration profile, the mixer including a plurality of separate microfluidic channels for splitting the combined fluid stream into separate fluid streams, rotating the separate fluid streams relative to each other so that the concentration profile is also relatively rotated and recombining the separate fluid streams to obtain a recombined fluid stream having a folded over concentration profile and an increased concentration gradient.

15. The chip as claimed in claim 14, wherein the channels rotate the fluid streams in opposite directions.

16. The chip as claimed in claim 14, wherein the concentration gradient is increased exponentially.

17. The chip as claimed in claim 14, wherein the fluid streams are mixed by diffusion.

18. The chip as claimed in claim 14, wherein the fluid streams are rotated in a helical fashion.

19. The chip as claimed in claim 14, wherein the fluid streams are mixed at Reynolds numbers between 0.1 and 2.

20. The chip as claimed in claim 14, wherein at least one of the separate microfluidic channels has a substantially square cross-section.